

Compiled and Edited by
Felicity Rose (UoN) & Vivek Mudera (UCL)

Contents

From the Editors	1
The UK stem cell bank	2
Commercialisation of stem cells and Tissue Engineering Research	3
Technical note – Tip and Tricks of Technovit 9100 New® Resin	4
Conference Review	
TCES & BSMB Conference – Bristol	6
EPSRC summer School – Nottm	7
Forthcoming Tissue Engineering Conferences	8

From the Editors

Winter is truly in its stride which means it is time for the second TCES newsletter. This time we have a focus on stem cells with an overview of the recently opened UK stem cell bank and a look at the commercialisation of stem cell and tissue engineering research. For those of you still in the laboratory, there is a technical note on the use of Technovit 9100 New® resin which allows sectioning of decalcified bone. This will be useful for those of you engineering bone constructs, perhaps

from stem cells. In addition, there are summaries of the excellent TCES / BSMB conference held in Bristol this year and the EPSRC funded summer school in cell adhesion and migration at Nottingham.

This year we formalised our membership programme by introducing a membership fee (£20 non-students; £10 students). The monies generated from this will secure funding for the committee to hold future TCES meetings whilst keeping registration fees low. This is particularly important when we hold joint meetings with other societies, which we are keen to do occasionally, to broaden the scope of the TCES. Membership to the TCES entitles you to receive biannual newsletters and obtain reduced rates at our meetings. This means that you will shortly no longer receive the biannual TCES newsletter unless you are a fully fledged paying member of the TCES. Membership is easy, just fill in the direct debit form at the end of this newsletter and send it to your bank – that's it!

Don't forget that the TCES committee are looking for postgraduate and postdoctoral representatives to be the voice for your community. If you are interested then please email Matthew Dalby (m.dalby@bio.gla.ac.uk) detailing your research group, your position within the group and why you want to be on the committee by the 21st January 2005. The committee will then democratically vote in the new representative and you will be informed by email the outcome of your application

We hope to see you all at the next TCES meeting at Queen Mary, University of London, 20-22nd June 2005. Registration details will shortly be available on our website.

Felicity Rose & Vivek Mudera

The UK Stem Cell Bank

The world's first stem cell bank was officially opened on a stunningly beautiful spring afternoon in May 2004. Housed within the National Institute for Biological Standards and Control in South Mims, the UK Stem Cell Bank will lodge a wide range of ethically sourced, quality controlled human stem cells, including those derived from adult and foetal tissues, as well as human embryonic stem (ES) cell lines. The Bank will thus serve as a repository as well as a distribution centre of stem cells for the UK and international stem cell community. Additionally, the Bank will also be making important contributions to stem cell research by performing a comprehensive characterisation of each cell line deposited within the Bank. All cell lines deposited will be made readily available to academic and commercial researchers throughout the world who have obtained appropriate local ethical approval. In addition to research labs devoted to research-grade cell lines, the Bank also houses three GMP-accredited labs for the propagation of therapeutic-grade cell lines, thus accelerating the translation of bench research to clinical application.

The Health Minister, Lord Warner, officially opened the Stem Cell Bank and several hundred dignitaries and scientists attended the opening. The Stem Cell Biology Laboratory at King's College London, together with our stem cell colleagues from the Centre

for Life in Newcastle, are proud to be the first groups to deposit human embryonic stem cells into the Bank. The profound shortage of high quality and well-characterised human ES cell lines was one of the major motivating factors for our license application to the Human Fertilisation and Embryology Authority (HFEA) in 2001 for the derivation of such cells. In addition, one of the primary recommendations from the House of Lords Select Committee on Stem Cells was the establishment of a government-funded stem cell bank, and a requirement that every human ES cell line derived in the UK under licence from the HFEA be lodged in the Bank and thus made accessible to the greater scientific community. And although the availability of human stem cells is now much better than in 2001, there is still an urgent need for quality-controlled cell lines of both embryonic and non-embryonic sources. The establishment of the Stem Cell Bank is an important achievement in British science and again highlights the pragmatic and tightly regulated nature of stem cell research in the UK.

Stephen Minger
Director Stem Cell Laboratory
King's College London

Commercialisation of Stem Cells and Tissue Engineering Research

The field of stem cell and tissue engineering is a comparatively new area of interdisciplinary research that has the potential to touch many aspects of medicine. The Global Watch Magazine (DTI, May 2004) published that stem cell research in the UK and US is growing stronger as consistent results are inspiring confidence. It recognised that a timeframe of 10 to 25 years is necessary to address the technological, safety, regulatory and ethical issues associated with bringing products to the market with adult stem cells appearing to be the most promising candidates in the first instance.

Canada is appearing to be a major player in this field with \$20 million being invested in the Canadian Stem Cell Network that co-ordinate the efforts of stem cell research in Canada. Furthermore, Japan is leading the tissue engineering field in Asia and there are potential collaboration opportunities for UK companies and academics. A total number of around 110 stem cell/tissue engineering related companies have been identified in Europe with the majority being young, small, research- and technology-oriented companies. Examples of such companies in the UK include Intercytex, RegenTec, ReNeuron and Renovo. This trend is similar to the US highlighting the fact that academic research is vital for the commercial success of this area. What

appears to be different in the US is that there are more public/private collaborations indicating a better networking in this sector compared to Europe.

The business model for stem cell/tissue engineering companies seems to combine long R&D development times, focussed markets, together with one of its greatest tasks being to prove that it is safe, cost-effective and superior to alternative treatments. Another challenge that European companies face is the lack of a specific regulatory framework covering all member states and patentability issues. The UK Patent office has published a Notice on what inventions related to stem cells can be patented. In summary the use of human embryos or human totipotent cells that have the potential to develop into all tissue types found within the human body are not patentable. Human embryonic pluripotent stem cells arising from the division of pluripotent cells do not have the ability to develop into all tissue types and therefore could be patented. It is noted that individual cases are to be treated on their merits and the relevant circumstances.

Maria Taraktsoglou
Medici Fellow, University of
Nottingham

References:

<http://www.globalwatchonline.com/missions/tmsmrep.aspx#life>

"Human tissue-engineered products-Today's markets and future prospects" October 2003, published by the European Commission.

<http://www.doh.gov.uk/cmo/progress/stemcellresearch/index.htm>

<http://www.patent.gov.uk/patent/notices/practice/stemcells.htm>

Technical Note: Tips and Tricks of Technovit 9100 New® resin.

Technovit 9100 New® resin (Heraeus Kulzer GmbH, Germany) is a new plastic resin for calcified tissue that preserves epitope antigenicity for immunohistochemistry as well as tissue morphology. Before use, the resin requires destabilisation by running it through an aluminium oxide column. The stabilised resin is usually light brown in colour but turns clear after destabilisation. The aluminium oxide collects the dirt and turns purple/blue due to the solution being basic. If a red colour appears then discard the resin. Resin should be stored in dark bottles and away from light. The destabilised resin has a shelf life of 1 week if stored at 4°C or 2 weeks if stored at -20°C.

Polymerisation will only occur if oxygen is excluded. This can be achieved by filling the mould to the top and securing the lid tightly to remove the air, or by placing a polyethylene film over the top and then closing the lid. Polymerisation times at -20°C can vary from 7 days to 14 days (longer than the time indicated on the manufacturer's data sheet). If moulds are opened before polymerisation is complete samples may become ruined and will not polymerise even after several weeks at -20°C. Once polymerised, bone samples can be cut 2-6 µm thick. If tissue samples were neither fully dehydrated, nor placed in xylene until samples turned

translucent, white precipitate will be present within the tissue and will cause the sample to crumble during sectioning.

Reference: Yang R *et al* (2003) Immunohistochemistry of matrix markers in Technovit 9100 New®-embedded undecalcified bone sections. *Eur Cell Mater* (6) 57-71.

Catrin Davies

AO Research Institute, Davos, Switzerland.

TCES Conference at Bristol 2004

The combined autumn meeting of the BSMB and TCES was held on the 13th & 14th September 2004 in the grand surrounds of the Wills Memorial Building, Bristol University with over 150 delegates attending from all over the UK and the world.

On day one the sessions were opened by Robert Nerem who reviewed some of his work, followed by Lara Kevorkian, Olga Boubriak, Simon Tew, Anders Lindal, Brian Ashton and Alessandra Pavesio who presented work on MMP's, bioreactor monitoring, induction of the sox9 gene and ACL. In the evening the conference dinner was held in the SS Great Britain, Brunel's famous Atlantic crossing steam ship. After dinner it was back to their rooms for the sensible ones, or for those still in the mood it was a trip to one of the excellent Bristol pubs!

On the second day the poster competition was awarded by delegate vote going to Ana MacIntosh, Hadi Mirmalek-Sani and Amanda Hall who each received a £150 prize. The Tuesday presentations were started by Paul Hatton presenting on chondrocytes on different scaffold architectures, followed by Kevin Shakesheff, Jean-François Clémence, Andrew Newby, Chris Evans, David Green and Stephen Ball who presented on the general subject areas of scaffold materials, gene therapy and vascular tissue engineering. After

lunch there were presentations from Ivan Martin, Ranieri Cancedda, Anne Bishop and Alexandra Stolzin. After tea Richard Smith presented work on pancreatic islets, Shelia MacNeil on skin repair, Hazel Screen on tendon and Amanda Hall finished the session by presenting work on *in vitro* production of zoned cartilage.

The meeting highlighted the progress of tissue engineering and appeared to condense the view that cell and tissue classifications are more limited than expected. Overall the talks showed the benefit of implementing cell based therapies. "The TCES meeting, was a BSMB meeting, was an enjoyable meeting!"

Daniel Howard - Postdoctoral
Researcher, University of Nottingham
&
Hadi Mirmalek-Sani - Postdoctoral
Researcher, University of
Southampton.

EPSRC Summer School at Nottingham University

In September this year, the Centre for Mathematical Medicine (CMM) at the University of Nottingham hosted the second EPSRC-funded Summer School "Cell adhesion and migration: the interface with tissue engineering". While the first School, held in 2002, focussed on cell-scale phenomena, the second School covered the behaviour of cell populations.

The School attracted graduate students and post-doctoral researchers wishing to learn about cell adhesion and migration and the role of these fundamental processes in the rapidly developing field of tissue engineering. The participants included biologists, physical scientists, engineers and mathematicians. They gained an overview in the relevant biological background, experimental techniques and theoretical models through a series of lectures, tutorials and laboratory tours. The participants also gained first-hand experience of multi-disciplinary research by pooling their expertise to develop mathematical models of some simple tissue engineering problems. We were particularly fortunate to have several distinguished guest lecturers from around the UK, and we also welcomed Professor Steve Cowin from the City University of New York who gave two lectures on bone remodelling.

The CMM comprises members of the

University of Nottingham who use mathematics to provide insight into biomedical phenomena. We are always keen to develop new collaborations with biomedical scientists both within the University of Nottingham and elsewhere.

For further details of activities and forthcoming events run by the CMM please see <http://www.maths.nottingham.ac.uk/Cmm/index.cgi> or contact:

Prof. Helen Byrne
helen.byrne@nottingham.ac.uk,

Prof. Oliver Jensen
oliver.jensen@nottingham.ac.uk

Dr Sarah Waters
sarah.waters@nottingham.ac.uk

Sarah Waters
Lecturer in Applied Mathematics
University of Nottingham

TCES Conference June 2005

June 20-22nd 2005
Queen Mary, University of London

Details of registration will follow shortly, see our website for details:

www.tces.org.uk

Forthcoming Tissue Engineering Meetings

Meeting of the British Society for Matrix Biology

"Collagen – from genes to fibrils"

University of Liverpool
March 21st and 22nd 2005

Registration will open in January:
See BSMB web site for details
www.bsmb.ac.uk

UK Society for Biomaterials

University of Nottingham
June 21st and 22nd 2005

Abstract deadline 28th February 2005

Initial enquiries to Angela Kuhn at
a.kuhn@nottingham.ac.uk or on
0115 951 5998.

2nd World Congress on Regenerative Medicine

Congress Centre, Leipzig, Germany
18th - 20th May 2005

www.oarsi.org

European Society for Biomaterials

University of Naples Federico II,
Sorrento, Italy
11th – 15th September 2005

Abstract deadline 31st January 2005

www.esb2005.it

European Tissue Engineering Society

Ludwig-Maximilians University, Munich,
Germany
31st August – 3rd September 2005

Abstract deadline 1st May 2005

www.etes2005.org

TCES Board

President

Professor Alicia El Haj
Centre for Science & Technology in
Medicine
University of Keele

Secretary

Professor David Lee
Medical Engineering Division and IRC in
Biomedical Materials
Queen Mary, University of London

Treasurer

Professor Charlie Archer
Connective Tissue Research Group
University of Cardiff

Board Member

Dr Vivek Mudera
TREC (Tissue Repair & Engineering
Centre)
UCL Stanmore
(Co-editor of TCES newsletter)

Board Member

Dr Matt Dalby
Centre for Cell Engineering
University of Glasgow
(Website design and maintenance)

Board Member

Dr Felicity Rose
Tissue Engineering Group
University of Nottingham
(Co-editor of TCES newsletter)

We look forward to hearing from you!
Your input is appreciated, please email
us at

f.rose@nottingham.ac.uk
v.mudera@ucl.ac.uk

Non-student membership

STANDING ORDER MANDATE

To Barclays Bank Plc _____

Branch _____

PLEASE TICK RELEVANT BOX:-

NEW INSTRUCTION

PLEASE AMEND PREVIOUS STANDING ORDER
QUOTING REFERENCE/BENEFICIARY

ACCOUNT TO BE DEBITED

BENEFICIARY DETAILS

SORT CODE

BANK

Barclays

ACCOUNT NUMBER

BRANCH DETAILS

121 Queens St. Cardiff CF1 1SG

ACCOUNT NAME

SORT CODE

2 0 1 8 1 7

ACCOUNT NUMBER

9 0 6 6 0 7 2 8

BENEFICIARY NAME

TCES

REFERENCE

PAYMENT DETAILS

AMOUNT OF FIRST PAYMENT

£

20.00

DATE OF FIRST PAYMENT

01 01 05

AMOUNT OF USUAL PAYMENT

£

20.00

AMOUNT OF USUAL PAYMENT IN WORDS

Twenty pounds and zero pence

WHEN PAID

(WEEKLY, MONTHLY, ANNUALLY, ETC)

Annually

DATE OF USUAL PAYMENT

01 01 05

COMPLETE EITHER
AMOUNT OF LAST PAYMENT

£

AND DATE OF LAST PAYMENT

OR PLEASE CONTINUE PAYMENTS UNTIL FURTHER NOTICE YES

CUSTOMER SIGNATURE(S)

DATE

CUSTOMER CONTACT TELEPHONE NUMBER

**ALL WHITE BOXES MUST BE COMPLETED
IN ORDER FOR THE STANDING ORDER TO BE PROCESSED**

273 (02/02)

Student membership

STANDING ORDER MANDATE

To Barclays Bank Plc _____

Branch _____

PLEASE TICK RELEVANT BOX:-

NEW INSTRUCTION

PLEASE AMEND PREVIOUS STANDING ORDER
QUOTING REFERENCE/BENEFICIARY

ACCOUNT TO BE DEBITED		BENEFICIARY DETAILS	
SORT CODE	<input type="text"/>	BANK	<input type="text" value="Barclays"/>
ACCOUNT NUMBER	<input type="text"/>	BRANCH DETAILS	<input type="text" value="121 Queens St. Cardiff CF1 1SG"/>
ACCOUNT NAME	<input type="text"/>	SORT CODE	<input type="text" value="2 0 1 8 1 7"/>
		ACCOUNT NUMBER	<input type="text" value="9 0 6 6 0 7 2 8"/>
		BENEFICIARY NAME	<input type="text" value="TCES"/>
		REFERENCE	<input type="text"/>

PAYMENT DETAILS			
AMOUNT OF FIRST PAYMENT	£ <input type="text" value="10.00"/>	DATE OF FIRST PAYMENT	<input type="text" value="01"/> <input type="text" value="01"/> <input type="text" value="05"/>
AMOUNT OF USUAL PAYMENT	£ <input type="text" value="10.00"/>		
AMOUNT OF USUAL PAYMENT IN WORDS	<input type="text" value="Ten pounds and zero pence"/>		
WHEN PAID (WEEKLY, MONTHLY, ANNUALLY, ETC)	<input type="text" value="Annually"/>	DATE OF USUAL PAYMENT	<input type="text" value="01"/> <input type="text" value="01"/> <input type="text" value="05"/>
COMPLETE EITHER AMOUNT OF LAST PAYMENT	£ <input type="text"/>	AND DATE OF LAST PAYMENT	<input type="text"/> <input type="text"/> <input type="text"/>
OR PLEASE CONTINUE PAYMENTS UNTIL FURTHER NOTICE <input type="checkbox"/> YES			

CUSTOMER SIGNATURE(S)	<input type="text"/>	DATE	<input type="text"/> <input type="text"/> <input type="text"/>
CUSTOMER CONTACT TELEPHONE NUMBER	<input type="text"/>		

**ALL WHITE BOXES MUST BE COMPLETED
IN ORDER FOR THE STANDING ORDER TO BE PROCESSED**

273 (02/02)